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PREPRINT

Rapid Thermal Outgassing of Component Samples

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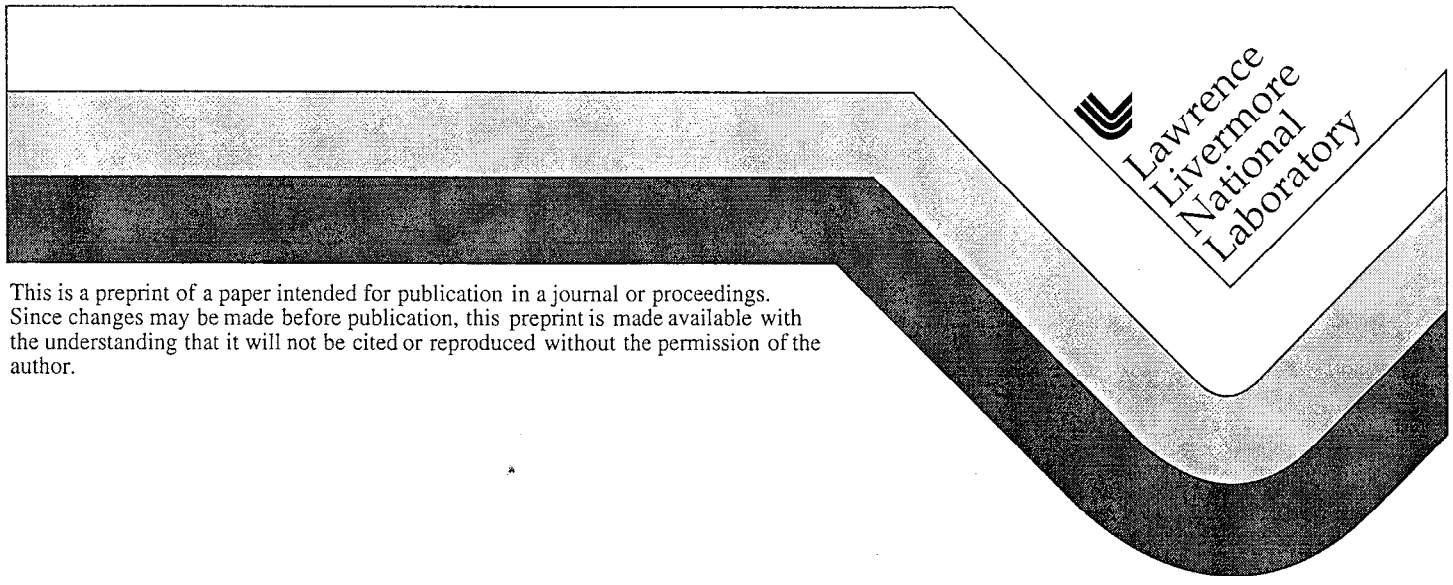

RAPID THERMAL OUTGASSING OF COMPONENT SAMPLES

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INTRODUCTION

This paper/presentation will describe the rapid thermal outgassing tests that were ran to provide an inventory of all gasses present in the weld channel during the weld. The component samples tested were of all materials that are exposed to the channel during the temperature excursion due to the welding operation. The temperature ramps were determined from previous weld tests. The test equipment, test procedures, and the data collection system will be described. We will present the data and our interpretation of it.

EQUIPMENT DESCRIPTION (figure 1)

The equipment used for these tests is a modified outgassing system. It is pumped by turbomolecular pump backed by a mechanical pump. The system is all metal sealed except for the gate valves, that have O-rings. There are pressure measurement transducers located on both sides of a fixed aperture. A Residual Gas Analyzer (RGA) is located on the low-pressure side of the aperture. The heat is supplied by a quartz lamp mounted inside the chamber. A Barber-Colman programmable controller controls temperature. Temperature was measured at the test sample. A computer recorded the data.

MATERIALS TESTED

The component samples tested were of all materials that are exposed to the channel during the temperature excursion due to the welding process. We also tested tape and shim stock used elsewhere in the assembly.

TEST PROCEDURE

CONDITIONING CYCLE

Load the test sample to test specifications on fixture.
Pump down chamber to high vacuum
Set up B/C controller for the conditioning temperature and time. (24hrs +/- _ hr)
Let chamber cool approximately 1 hr.
Close hi-vacuum valve
Open the airflow valve and the vent valve.
Flow dry air (35 PPM) over sample for 24 hrs (+/- _ hr)

TEST PROCEDURE (cont.)

TEST CYCLE

Pump down chamber to high vacuum using bypass and the .030" orifice.
Pump for 1 hour after the ion gage filaments are turned on.
Set up the data acquisition terminal and the temperature controller for the ramp to be used. The ramp time is 17 seconds.
Start data acquisition, then ~ 20 seconds later close the bypass valve on the chamber.
Accurately record heat cycle start time, immediately after closing the bypass valve.
Start the heat controller and the timer at once.
After the 17 seconds, shut off the heat controller and ~ 30 seconds later stop the data acquisition program.
Retrieve the data and process accordingly.

DATA COLLECTED (figure 2)

The data collected included the pressure rise during the temperature ramp, RGA data, and the pressure on the low pressure side of the aperture and the temperature. The gas load of the sample is calculated by multiplying the pressure rise during the thermal ramp by the volume in the chamber plus the gas removed through the aperture. The gas load in the weld channel (in Torr-Liters) is calculated by multiplying the sample gas load by the length of that material exposed in the channel and divided by the length of the sample. The pressure in the channel (in Torr) can be calculated by dividing the gas load by the volume of the channel.

DATA REDUCTION (figure 3)

In figure 3 we show the reduced data in tabular form showing the gas load from various materials in various configurations. We also show the calculated pressure in the channel due to these gas loads.

CONCLUSION

The data indicates that the major gas load is from the thin gasket, even with the 2mm cutback we see a pressure rise in the channel of 6 torr. If the gasket were allowed to move and come in contact with the D-38 we would expect to see weld blowout as the pressure in the channel will rise to 22 torr. The gas load from the coated rubber is quite low even when it is within 1mm of the weld. The cleaning procedure used for the D-38 made little or no difference in the total gas load. We will complete test on the salt prior the April meeting and will present that data then.

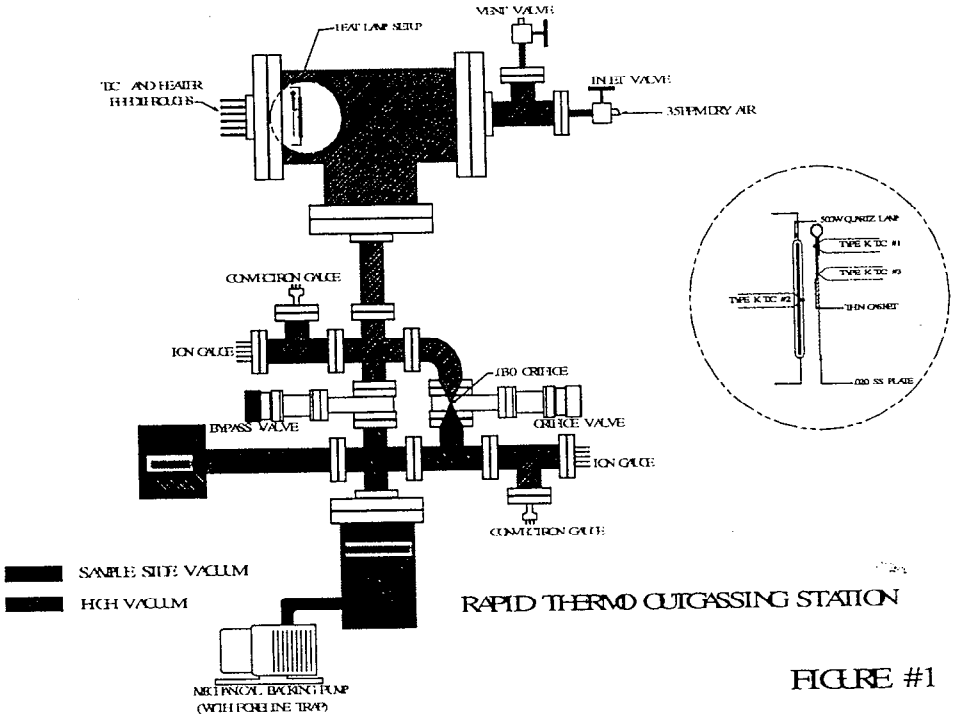

Figure 1. Rapid Thermo Outgassing Station

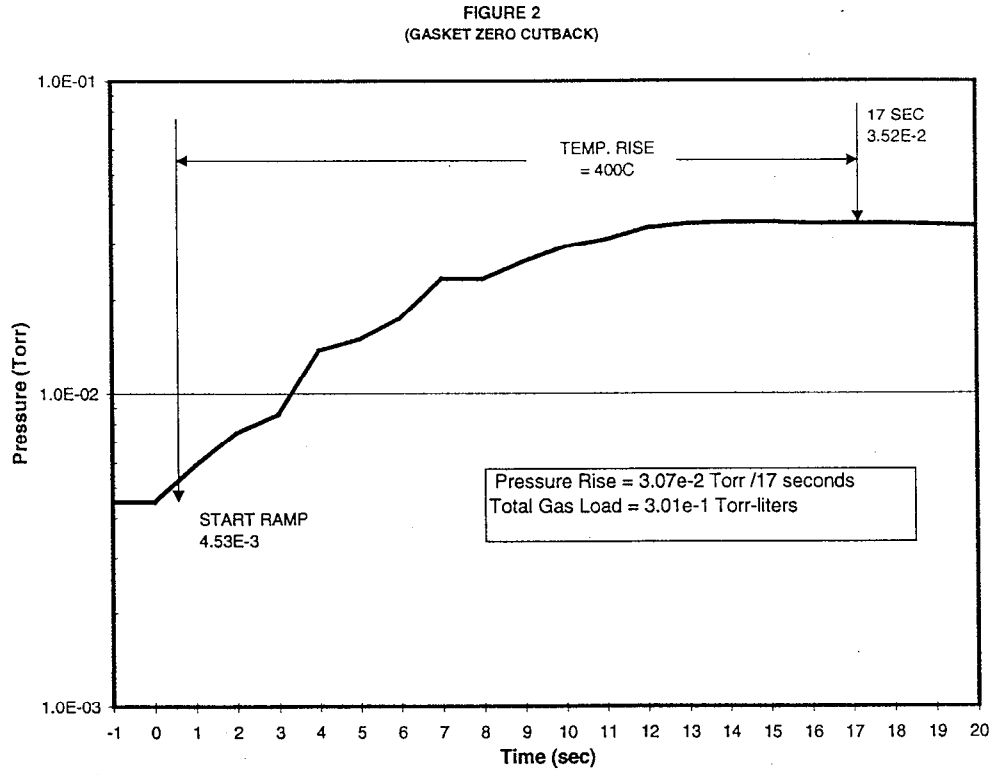

Figure 2. Typical data.

Table I. Test results.

Component	Temp Rise (deg C)	Cutback	Pressure Rise (torr)	Gas Load Torr-liters	Channel Pressure (torr)
Thin Gasket	400 c/17sec.	O	3.07E-02	**2.31E+01**	**2.28E+01**
Thin Gasket	400 c/17sec.	2 mm	8.16E-03	**6.13E+00**	**6.06E+00**
Coated Rubber	20 c/17sec.	1 cm	1.06E-04	**1.58E-01**	**1.57E-01**
Coated Rubber	20 c/17sec.	2 cm	6.30E-05	**9.41E-02**	**9.36E-02**
Coated Rubber	20 c/17sec.	3 cm	9.40E-06	**1.40E-02**	**1.40E-02**
Coated Rubber	20 c/17sec.	4 cm	5.64E-06	**8.43E-03**	**8.38E-03**
Metal (Before)	450 c/17sec	NA	6.00E-05	**2.49E-03**	**2.49E-02**
Metal (After)	450 c/17sec	NA	4.90E-05	**1.43E-03**	**1.43E-02**
Metal (Nitric)	450 c/17sec	NA	5.20E-05	**1.66E-03**	**1.66E-02**

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